

**SPENT COFFEE GROUNDS AS SUPPLEMENTARY FINE  
AGGREGATES TO CONCRETE PAYER BLOCKS**

**THESIS**

**JUSTINE FRANCIS E. GOÑA  
MARK RENZEL M. ROMEA**

**College of Engineering and Information Technology**

**CAVITE STATE UNIVERSITY**

**Indang, Cavite**

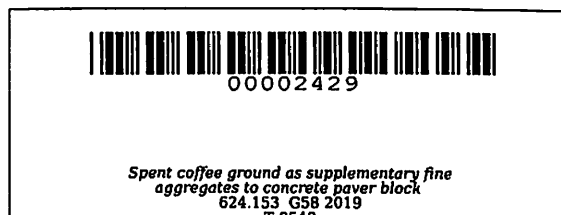
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# **SPENT COFFEE GROUNDS AS SUPPLEMENTARY FINE AGGREGATES TO CONCRETE PAVER BLOCKS**

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**JUSTINE FRANCIS E. GOÑA**  
**MARK RENZEL M. ROMEA**

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## **ABSTRACT**

**GOÑA, JUSTINE FRANCIS E. AND ROMEA, MARK RENZEL M. ,Spent Coffee Grounds as Supplementary Fine Aggregate to Concrete Paver Block.** Undergraduate Thesis. Bachelor of Science in Civil Engineering. Cavite State University, Indang Cavite. June 2019. Adviser. Engr. Roslyn P. Peña

The main objective of the study is to evaluate the use of coffee ground as fine aggregates for concrete paver blocks. Specifically, it aimed to determine the physical properties of spent coffee grounds; compare the compressive strength of paver block with different mix proportions of coffee grounds and sand in 7,14, and 28 days curing; compare the cost of commercially available concrete paver to paver with spent coffee grounds; determine the most economical mixture of concrete paver block using Spent Coffee Ground as partial substitute for fine aggregate and to observe the other effects of spent coffee grounds in concrete paving blocks. The study used five trial mix design of concrete with partial replacement of coffee grounds to sand which varies from 0 percent, 5 percent, 10 percent, 15 percent and 20 percent.

Different tests were used in evaluating the effects of different level of substitution of sand and coffee grounds in concrete paver block. These tests include fineness, gradation test, absorption capacity, moisture content, and density test (loose and compact) for coffee grounds. Slump test for freshly mixed concrete and compressive test for concrete blocks.

It is observed that coffee grounds had finely granulated particle size and smoother in texture compared to sand. Physically, it was also light in weight. Its observed appearance were dark brown in colour, uniform in shape and had a strong aroma. Coffee

ground bored physical resemblance to sand, fine granular particles produced less friction and made the concrete more consistent and workable

Results revealed that treatment 1 with 5 percent coffee ground garnered the highest compressive strength among all substitution. This result is an implication that coffee ground and its level of substitution to sand affect the compressive strength of the concrete block. As the amount of coffee ground substitution increases the compressive strength decreases. Nevertheless, the compressive strength of concrete paver blocks with coffee grounds did not meet the specified compressive strength for non-traffic grade concrete paving blocks requiring 8000 psi.

The mixture with the least cost was the control mix. It was rated Php 10.83 for each piece of concrete blocks. Hence, the most expensive mix was the Treatment 4 with 20 percent coffee grounds which costs Php 23.65 for each piece of concrete block. Thus, as the amount of coffee ground increases, the cost also increases.

It has been recommended that alternative stabilization methods may be employed to increase the efficiency of coffee grounds until relevant strength benchmarks are met. Moreover, raw coffee grounds should not be subjected to oven drying; instead determining absorption capacity of coffee grounds should be carried out before adding amount of water computed in the concrete mix.

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**Justine Francis E. Goña  
Mark Renzel M. Romea**

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## **INTRODUCTION**

The Philippines has become one of the world's largest importers of soluble coffee. It is the second fastest growth coffee market between 2011-2020 and is projected to become one of the world's largest five consumers by 2021. (Bamber-Daly et al., 2017) As of 2014, the Philippines produced 25,000 metric tons of coffee and is ranked 110<sup>th</sup> in terms of output. However, local demand for coffee is high with 100,000 metric tons of coffee consumed in country per year (Flores, W.L. ,2014) .The Province of Cavite was known as the coffee capital of the Philippines, producing the coffee needs of Manila as well as other parts of the country. Based on 2012 data of the Bureau of Agriculture Statistics, Cavite has 8,335 hectares of land devoted to coffee with estimated 7,683,770 coffee bearing trees.

An estimate done in 2008 suggested that as a result of coffee brewing, the world produced 7.4 million tonnes of spent coffee ground (Kondamudi et al., 2008). Coffee